

## **2D Materials and Devices for Energy Conservation and Conversion**

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Transition metal dichalcogenides (TMD) have opened up avenues in ultra-low power beyond-CMOS logic and memory device concepts involving single/many-particle 2D-2D tunneling showing negative differential resistance, and topological insulators (TI) show promise for spintronics. We will discuss CVD and MBE growth of TMDs such as MoS<sub>2</sub>, WSe<sub>2</sub>, MoTe<sub>2</sub> and ReS<sub>2</sub>, and schemes for doping and ohmic contact formation to these materials. Novel low power logic and memory devices possible in 2D materials will be discussed. MBE of TIs such as Bi<sub>2</sub>Se<sub>3</sub> which show spin-helical locking will be discussed for novel logic and non-volatile memory applications.

For energy conversion, we will discuss initial efforts in incorporating graphene with Si for metal-insulator-semiconductor solar cells. Graphene could replace ITO front contacts.